Accident Database: Boilers, Pressure Vessels, and Piping

AIS Accident Inspection Specialists, Inc.

Boiler Accident Database | Pressure Vessel Accident Database | Piping Accident Database

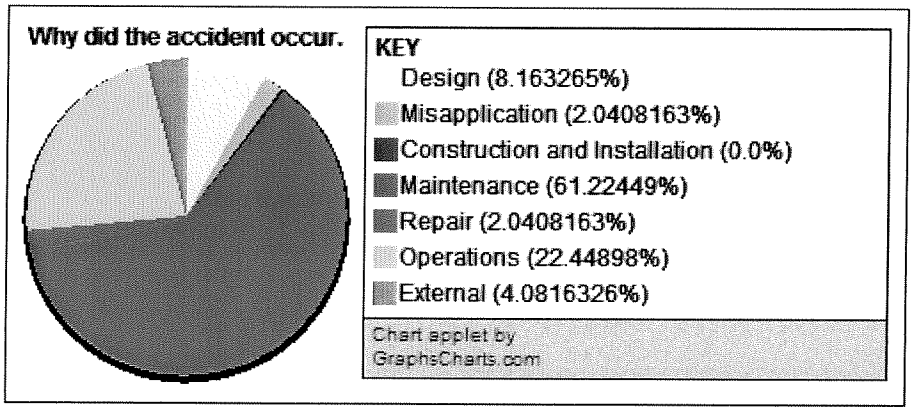
Welcome to the accident database. This is a repository of a boiler accident database, a pressure vessel accident database, and piping accident database. This accident database is searchable. This accident database is maintained at AIS Accident Inspection Specialists, Inc. This boiler accident database and pressure vessel accident database is a repository from a broad range of sources. This accident database is maintained by volunteers, like you, that believe in open reporting of the fact while being respectful of the privacy and confidentially of other parties. The completeness of the information is important.

Select Search Parameters

Country **State** **Year** **Type of Vessel**

Leaving a field blank will select all entries for that field.

Submit Query | Reset



Do You have an accident that you would like to report?

Accident Reporting Form

This form will insert your data into the accident database for boilers, pressure vessels, and piping.

The goal of the boiler accident database and the pressure vessel database including a repository of a piping accident database is to support safe and knowledgeable use of boilers, pressure vessels, and piping. This is done by identifying the types of type of boilers, pressure vessels, and piping as they relate to the accident. Case [accident] specific data is then generated along with statistical summary information on the submitted factors as they are associated with the incidents or accidents. The users, operators, manufacturers, and owners of the vessels in the community at large can learn about the events and try to prevent such events from reoccurring in their facilities.

Data Digest **September 2001**

Boiler, Pressure Vessel Accidents up 24 percent

Human error often to blame; National Board calls for renewed focus on training and education

By TIM BAKER
Managing Editor

The National Board of Boiler and Pressure Vessel Inspectors describes the 24 percent increase in boiler and pressure vessel accidents from 1999 to 2000 as "dramatic." The National Board annually surveys boiler owners and operators to track all incidents and publishes those results in the National Board Incident Report.

Cause	Accidents	Injuries	Deaths
Power boilers			
Safety valves	1	0	0
Low-water condition	183	7	0
Limit controls	22	1	0
Improper installation	15	0	0
Improper repair	16	0	0
Faulty design or fabrication	8	0	1
Operator error or poor maintenance	193	12	0
Burner failure	10	0	7
Unknown/under investigation	12	0	0
Subtotals	460	20	8
Heating boilers: steam			
Safety valves	14	0	0
Low-water condition	437	0	0
Limit controls	66	0	0
Improper installation	22	0	0
Improper repair	23	0	0
Faulty design or fabrication	34	0	0
Operator error or poor maintenance	412	2	0
Burner failure	19	0	0
Unknown/under investigation	20	0	0
Subtotals	1047	2	0
Heating boilers: water (includes hot-water supply)			
Safety valves	7	0	0
Low-water condition	256	0	0
Limit controls	69	0	0
Improper installation	68	0	0
Improper repair	28	0	0
Faulty design or fabrication	40	0	0
Operator error or poor maintenance	406	1	0
Burner failure	30	0	0
Unknown/under investigation	52	1	0
Subtotals	956	2	0
Unfired pressure vessels			
Safety valves	7	0	0
Limit controls	6	0	0
Improper installation	9	0	0
Improper repair	11	0	0
Faulty design or fabrication	15	1	0
Operator error or poor maintenance	169	0	0
Unknown/under investigation	4	2	6
Subtotals	221	3	6
Totals	2,686	27	14

***TABLE 1**. National Board of Boiler and Pressure Vessel Inspectors Incident Report for 2000. This was compiled from data collected by the National Board and insurance agencies as of January 31, 2001. All deaths and injuries are industry-related, and include incidents involving owners and operators. The survey had an 88 percent response rate from National Board jurisdictional authorities and a 52 percent response rate from National Board authorized inspection agencies. There was a 77 percent response rate overall.*

The 2000 National Board Incident Report reveals a 24 percent jump in the total number of incidents, from 2,163 in 1999 to 2,686 last year. (See related articles on pages 9 and 27.)A closer look at the statistics quickly points to some trends that the National Board finds disturbing. For

instance, nearly 90 percent of the incidents reported in 2000 were directly attributable to human error. The National Board defines "human error" inclusively in one of five broad categories: operator error or poor maintenance, low-water condition, improper repair, improper installation, and faulty design or fabrication.

A closer analysis shows that poor maintenance and low-water conditions were to blame in 76 percent of all boiler accidents and pressure-vessel accidents in 2000.

Good News

On the bright side, there was a 33 percent decrease in the number of fatalities in 2000. There were 14 deaths last year and 21 in 1999. 2000 also witnessed an 80 percent decrease in the total number of injuries. There were 136 reported injuries in 1999 and 27 in 2000. However, human error was to blame in 85 percent of the injuries in 2000, once again illustrating the need for better training.

The National Board warns against undue optimism, pointing out that 1999 was "an unusual year for catastrophic deaths and injuries." In that year, a single power boiler accident left six dead and 14 others injured. In another incident involving an unfired pressure vessel, two were killed and 50 others injured. "In other words, 1999 was far from what might be considered a typical year for the boiler and pressure vessel industry," wrote Donald Tanner, Executive Director of the National Board in the National Board Bulletin, Summer 2001.

With only 22 injuries and no deaths in 2000, the industry has made some improvements, but not enough according to the National Board.

The surge in the incidents categorized as "operator error or poor maintenance" and "low-water condition" is a bad sign, according to the National Board. For instance, incidents that stemmed from "operator error or poor maintenance" and "low-water condition" accounted for 58 percent of the injuries in 1999. In 2000, these categories were to blame in 81 percent of all the injuries. Furthermore, "What is not known from our report is the nature or extent of the injuries suffered, which could include anything from first-degree burns to the loss of limbs," according to Tanner.

Trends

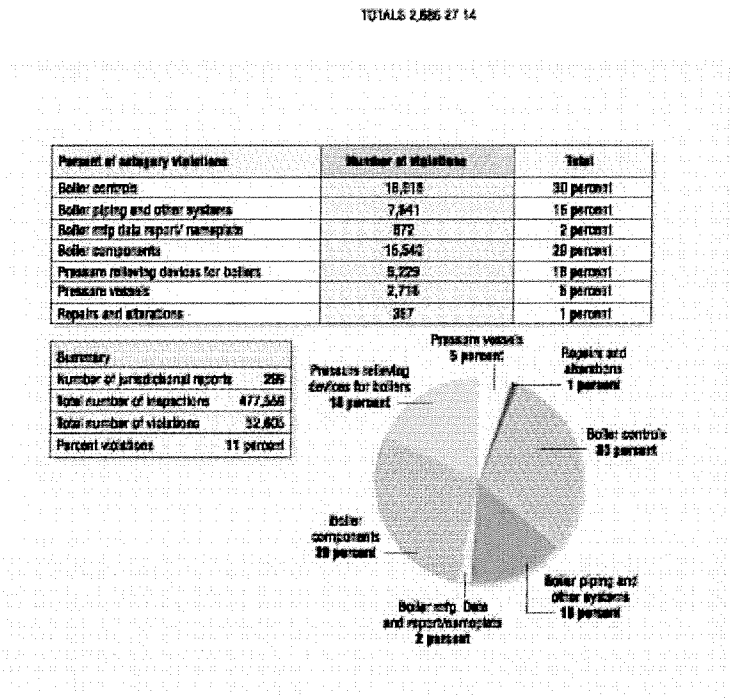
For the third year in a row, operator error or poor maintenance is the leading cause of boiler accidents, with a total of 1,011 incidents. For nine straight years, operator error or poor maintenance was the primary cause of unfired pressure vessel accidents, with 169 incidents reported in 2000.

Pressure-vessel accidents caused by operator error were up 182 percent. Steam-heating boiler accidents caused by operator error or poor maintenance were up 60 percent.

Violations

The National Board also tracks violations which did not lead to incidents or accidents. In many ways, this data, which represents a larger population of boiler owners, tell us a lot more about boiler maintenance nationwide than the incident data do. There were 52,605 reported violations last year

(See figure 1 on page 82). As with the incident report, a pattern of poor training rears its head upon closer inspection of the violation report. Over 16,000 of the reported violations, or a staggering 30 percent, were categorized as incidents involving boiler controls.



Percent of category violations	Number of violations	Total
Boiler controls	16,818	30 percent
Boiler piping and other systems	7,841	15 percent
Boiler mfg data report/ nameplate	872	2 percent
Boiler components	15,542	29 percent
Pressure relieving devices for boilers	9,229	18 percent
Pressure vessels	2,718	5 percent
Repairs and alterations	367	1 percent

Summary	
Number of jurisdictional reports	255
Total number of inspections	477,568
Total number of violations	52,805
Percent violations	11 percent

FIGURE 1. *Report of Violation Findings from the 2000 report by the National Board of Boiler and Pressure Vessel Inspectors. This report tracks violations that did not result in incidents or accidents.*

The number of incidents involving boiler piping and other systems was 7,841 (15 percent); boiler manufacturing data report or nameplate, 872 (2 percent); boiler components, 15,540 (29 percent); pressure-relieving devices for boilers, 9,229 (18 percent); and pressure vessels, 2,718 (5 percent).

"The Report of Violation Findings represents the other side of the coin from the annual incident report," said Victor Bogosian, director of inspections, in his report in the National Board Bulletin, Summer 2001. "Violation findings detail the types of violations cited during inspections; the incident report reflects after-the-fact explosions or accidents. In other words, violations findings records accidents averted."

According to Bogosian, there are some telling statistics in the violation report. The two largest categories of violations were "Boiler controls" and "Boiler components." The category "Boiler controls" includes low-water cutoff, flow sensing devices, pressure gauges, water gauge glass, and temperature and pressure controls. The "Boiler Components" category includes fireside water leaks, baffles and/or refractory, and the installation of the boiler itself. Nearly 60 percent of all the violations reported involved these two categories.

"The Report of Violation Findings is a good tool for tracking violations and identifying problem areas or trends," Bogosian said. "It also directs attention to and reinforces the effectiveness of safety inspections, as well

as helping to promote the concept that the safety inspection is a critical step in accident prevention."

The Report of Violations Findings was compiled by the National Board using 299 monthly reports received from 28 jurisdictions. The total number of inspections logged was 477,559 with 52,605 determined to be violations. Therefore, a safety violation was detected in one out of every 9 inspections.

To read the 2000 Incident Report in its entirety, contact the National Board at 614 888-8320 or visit www.nationalboard.org.

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Database Search

Select Search Parameters

Country	State	Year	Type of Vessel
United States	MI		

Leaving a field blank will select all entries for that field.

Submit Query | Reset

Country: US
State:
Year of Accident: 2001
Type of Vessel: Pressure Vessel Autoclaves
Units for Size: English
Size of Vessel: 6
Pressure Rating: 50
Year Built: 1999
Usage of Vessel: Heating
Industry: Institution
What: Injuries
Primary Reason of Accident Why: Operations
Details of Accident: Scalding of worker while removing contents from the autoclave.

|< | < | > | >| [6/7]

Size of Vessels are determined as follows:

Boilers are in mass flow rate-

Pounds per hour [lb/hr] -English
Kilograms per hour [kg/hr] -Metric

Pressure Vessels are measured in cross sectional area: length times height-

Sq. Feet - English
Sq. Meters - Metric

Piping is measured by nominal pipe diameter-

inches- English
centimeters -Metric

Pressure

Pounds per square foot [psi]- English
Bars - Metric where 100-kPa = 1-Bar

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Database Search

Select Search Parameters			
Country	**State**	**Year**	**Type of Vessel**
United States	MI		

Leaving a field blank will select all entries for that field.

Submit Query | Reset

Country: US
State:
Year of Accident: 2001
Type of Vessel: Pressure Vessel Autoclaves
Units for Size: English
Size of Vessel: 6
Pressure Rating: 50
Year Built: 2000
Usage of Vessel: Heating
Industry: Institution
What: Property_Damage
Primary Reason of Accident Why: Maintenance
Details of Accident: Door blew off autoclave.

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Size of Vessels are determined as follows:

Boilers are in mass flow rate-

Pounds per hour [lb/hr] -English
Kilograms per hour [kg/hr] -Metric

Pressure Vessels are measured in cross sectional area: length times height-

Sq. Feet - English
Sq. Meters - Metric

Piping is measured by nominal pipe diameter-

inches- English
centimeters -Metric

Pressure

Pounds per square foot [psi]- English
Bars - Metric where 100-kPa = 1-Bar

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Database Search

Select Search Parameters

Country	State	Year	Type of Vessel
United States	MI		

Leaving a field blank will select all entries for that field.

Submit Query | Reset

Country: US
State:
Year of Accident: 2001
Type of Vessel: Boiler Electric Steam Generator
Units for Size: English
Size of Vessel: 50
Pressure Rating: 50
Year Built: 1998
Usage of Vessel: Heating
Industry: Institution
What: Property_Damage
Primary Reason of Accident Why: Design
Details of Accident: Steam back-flowed into the piping which connects the water supply. The 3/4 inch PVC water supply pipe melted, causing steam/boiling water to leak out. Backflow preventer installed.

|< < > >| [5/7]

Size of Vessels are determined as follows:

Boilers are in mass flow rate-

Pounds per hour [lb/hr] -English
Kilograms per hour [kg/hr] -Metric

Pressure Vessels are measured in cross sectional area: length times height-

Sq. Feet - English
Sq. Meters - Metric

Piping is measured by nominal pipe diameter-

inches- English
centimeters -Metric

Pressure

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Database Search

Select Search Parameters			
Country	**State**	**Year**	**Type of Vessel**
United States	MI		

Leaving a field blank will select all entries for that field.

Submit Query | Reset

Country: US
State:
Year of Accident: 2001
Type of Vessel: Boiler Electric Steam Generator
Units for Size: English
Size of Vessel: 50
Pressure Rating: 50
Year Built: 1998
Usage of Vessel: Heating
Industry: Institution
What: Property_Damage
Primary Reason of Accident Why:
Details of Accident: Safety valve lifted and released horizontally at a height of 3 1/2 feet. The high pressure cut out switch had gotten wet and shorted it out. This was located in an autoclave.

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Size of Vessels are determined as follows:

Boilers are in mass flow rate-

Pounds per hour [lb/hr] -English
Kilograms per hour [kg/hr] -Metric

Pressure Vessels are measured in cross sectional area: length times height-

Sq. Feet - English
Sq. Meters - Metric

Piping is measured by nominal pipe diameter-

inches- English
centimeters -Metric

Pressure

Pounds per square foot [psi]- English

Accident Database: Boilers, Pressure Vessels, and Piping

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Database Search

Select Search Parameters			
Country	**State**	**Year**	**Type of Vessel**
United States	MI		

Leaving a field blank will select all entries for that field.

Submit Query | Reset

Country: US
State: MI
Year of Accident: 1999
Type of Vessel: Cast Iron Boiler
Units for Size: English
Size of Vessel: 100
Pressure Rating: 15
Year Built: 1964
Usage of Vessel: Heating
Industry: Institution
What: Fatalities
Primary Reason of Accident Why: Maintenance
Details of Accident: Furance explosion 5 fatalities and 20 injuries.

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Size of Vessels are determined as follows:

Boilers are in mass flow rate-

Pounds per hour [lb/hr] -English
Kilograms per hour [kg/hr] -Metric

Pressure Vessels are measured in cross sectional area: length times height-

Sq. Feet - English
Sq. Meters - Metric

Piping is measured by nominal pipe diameter-

inches- English
centimeters -Metric

Pressure

Pounds per square foot [psi]- English
Bars - Metric where 100-kPa = 1-Bar